|  |
| --- |
| **Lesson Title: SLIP,SLIDE,GRIP!!! (A lesson about friction)** |
| **Subject area / course / grade level:**  **Grade 4 - 6** |
| **Introduction:**  **This lesson introduces the concept of friction and how it affects the motion of objects.** |
| **Lesson Length: 45-60 min.** |
| **Materials:**  **Newton meters**  **Brick or similar heavy object**  **Any smooth surface (tile floor, etc..)**  **Any rough surface (carpet, gravel, etc..)**  **A computer for each pair of students, if available. (If not available, teacher demonstration is possible with one computer and a projector)** |
| **Lesson Overview:**  **This lesson will help students understand that friction is an opposing force between two objects, which can slow**  **Motion.** |
| **Tennessee Standards:**  0407.11.4 Plan and execute an investigation that demonstrates how friction affects the movement of an object.  SPI 0507.Inq.1 Select an investigation that could be used to answer a specific question.   |  | | --- | | **SPI 0607.Inq.1** Design a simple experimental procedure with an identified control and appropriate variables. | |
| **Lesson objective(s):**   1. To understand that friction is a force that slows moving objects. 2. To explain conclusions in terms of the roughness or smoothness of surfaces. 3. To relate results to predictions. 4. To begin to know how to plan a fair test. |
| **ENGAGEMENT:**   1. Place the word cards around the room. Ask the children to guess what the words are and what they are learning about. (friction, push, pull, grip, slip, slide, newtons(N), motion) 2. Demonstrate pulling a brick with a Newton meter - first on the carpet sample and then on the vinyl sample. 3. Watch video: <http://www.teachertube.com/viewVideo.php?video_id=75848&title=Friction_movie> 4. Demonstrate pulling a brick with a Newton meter - first on the rough surface and then on the smooth surface. 5. Ask the children whether it is more difficult for an object to start moving on a smooth or a rough surface. (You might prompt then with the idea of roller skating on a smooth surface versus a rough surface.) Ask them to explain their answer. 6. Encourage the children to explain their ideas using words such as roughness, smoothness, grip and slide or slip. 7. Explain to the children that where there is greater grip, there is a greater force of something called friction. |
| **EXPLORATION: (Hand out friction experiment worksheet)**   1. Give the children the following question - Does the type of surface affect how a sleigh travels? 2. Open the [Bitesize friction activity](http://www.bbc.co.uk/schools/ks2bitesize/science/physical_processes/friction/play.shtml) on an interactive whiteboard and demonstrate how to select a different track surface, and how to start the sleigh moving. Ask the children to predict on which surface they think the sleigh will move the furthest? On which surface do they think the sleigh will move the shortest distance? Ask the middle ability group to write a two-part prediction. Ask the higher ability group to create a two-part hypothesis. 3. Arrange the children in pairs or groups, with a computer for each group.   Ask the children to work through the activity, following the tasks written (and spoken) at the top of the screen. Ask them to record distances travelled (or flags reached) on paper. Give the lower ability group a table on which to record the results.  Note to teacher: If computers are unavailable for each pair of students, this activity can be completed as a demonstration. |
| **EXPLANATION:**   1. Ask the children if their predictions were right. 2. Discuss why the sleigh does not travel as far on the carpet, even though it received the same size push as on the other surfaces. 3. Encourage the children again to explain their ideas using words such as roughness, smoothness, grip, slide and slip. 4. Ask the higher ability group to create a two-part conclusion. 5. Ask the children if there is more friction between the sleigh and the carpet, or between the sleigh and the ice. 6. Develop the link between grip and the force of friction. Ask the children what this indicates about road surfaces. How can cars and bicycles be made safe? What will happen in the winter when the roads are icy? 7. Play the [Digger and the Gang - Stuck on the tracks game](http://www.bbc.co.uk/schools/digger/7_9entry/7.shtml). |
| **ELABORATION**  Ask children to complete the [friction worksheet (PDF 375KB)](http://downloads.bbc.co.uk/schools/teachers/ks2worksheets/bbc_teachers_ks2_science_worksheet_friction.pdf).  Allow time to share student responses.  Complete questions on the “Friction and Gravity” worksheet, with the class. You will be exposing students to how gravity affects motion. |
| **EVALUATION**  1. Teacher observation of student responses to the friction worksheet.  2. Give each student an index card and ask children to complete the [Bitesize friction quiz](http://www.bbc.co.uk/apps/ifl/schools/ks2bitesize/science/quizengine?quiz=friction&templateStyle=science). Display on white board or print quiz. |